



Tree – a Natural Air Conditioner



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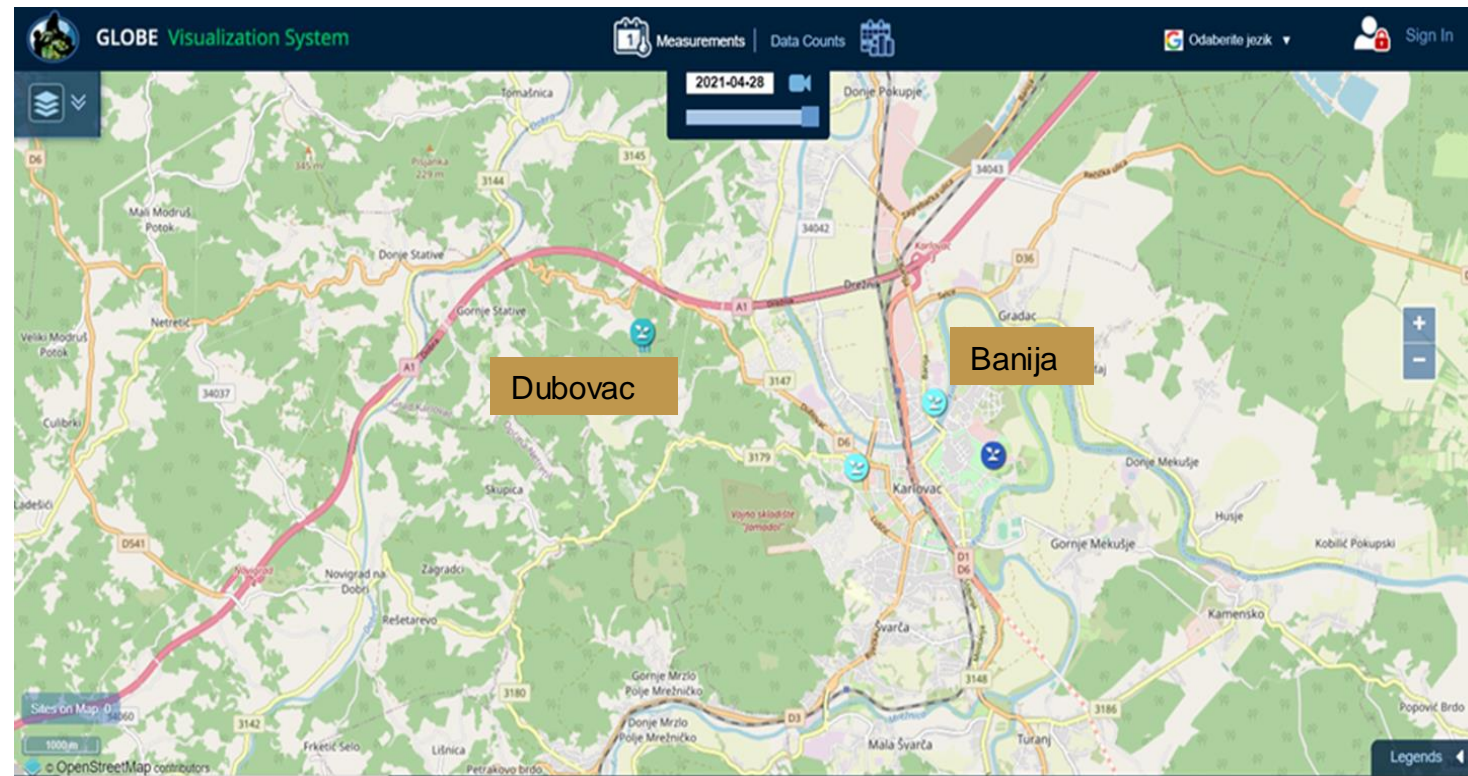
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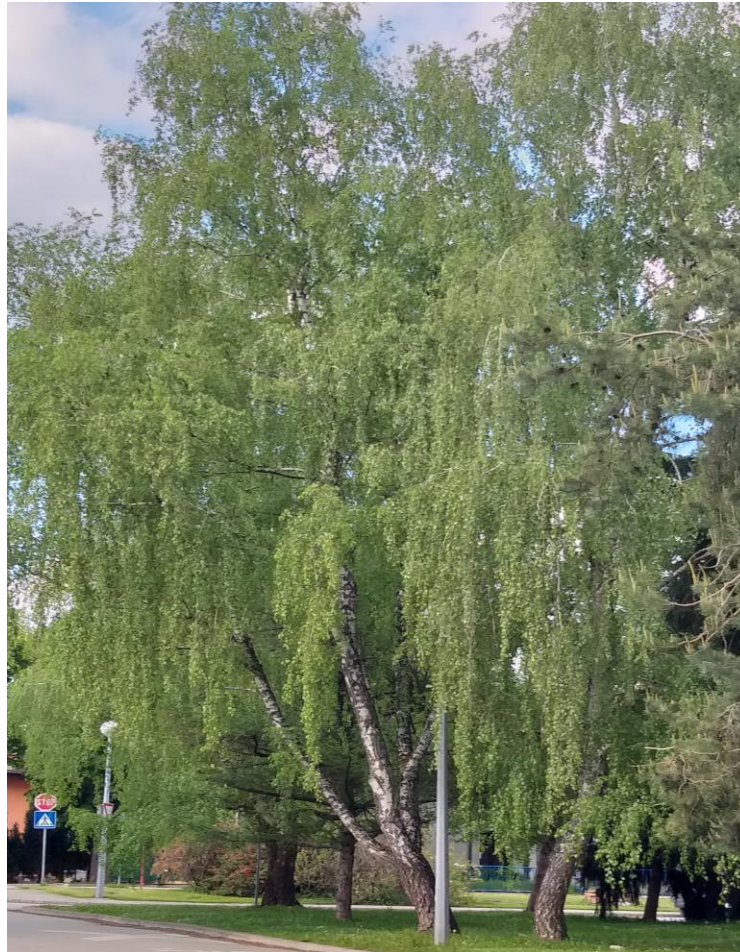
Introduction

For several years our schools have been cooperating in the European Phenological Campaign.





Birch - OŠ Dubovac 19,10 m



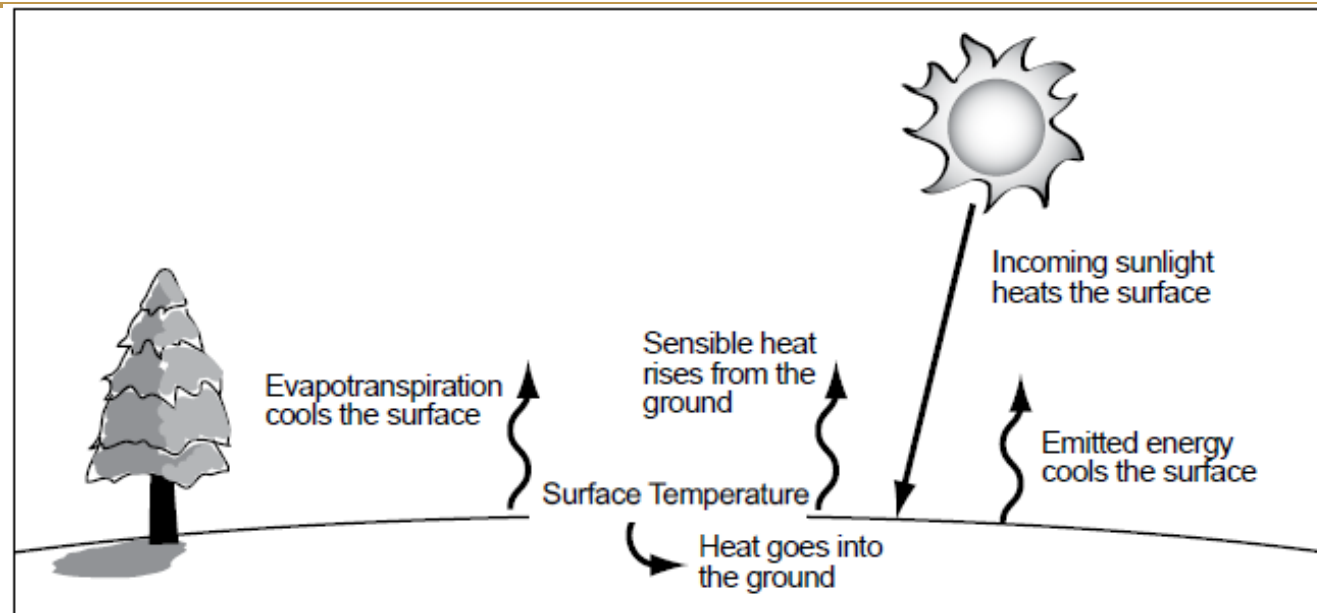
Birch - OŠ Banija 20,45 m





The surface temperature is the temperature at which energy is emitted from the surface in the form of electromagnetic radiation.

A part of the received solar energy is reflected off the ground and a part of the energy is absorbed by the ground which starts to warm up.





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**Locations of
surface
temperature
measurments**

a) grassy surface
under the birch
trees

b) grassy surface
under the parasol

c) sunny grassy
surface



OŠ Banija



OŠ Dubovac





Research questions

1. Is the current temperature of the air always lower than the surface temperature of the soil on the sunny grass at both stations?
2. Is the surface temperature of the soil on the sunny grass always higher than on the grass under the birch trees and under the parasol at both stations?
3. Will the surface temperature of the soil on the sunny grass in the observed period be higher at both stations, if the soil moisture is lower?



Hypotheses

1. The current temperature of the air will always be lower than the surface temperature of the soil on the sunny grass on both stations
2. The surface temperature of the soil on the sunny grass will always be higher than the surface temperature of the soil on the grass under the birch trees and under the parasol on both stations.
3. The surface temperature of the soil, on both stations, on the sunny grass will be higher, if the moisture of the soil is low



Research methods

Research time: 13.6.2022. – 23.9.2022.

(break from 15.7.to 21.8.2022. –school holiday)

Selected day for research:

- hot day (max.temp. ≥ 30 °C) and warm day(max.temp. ≥ 25 °C)
- the amount of cloud cover $< 50\%$.

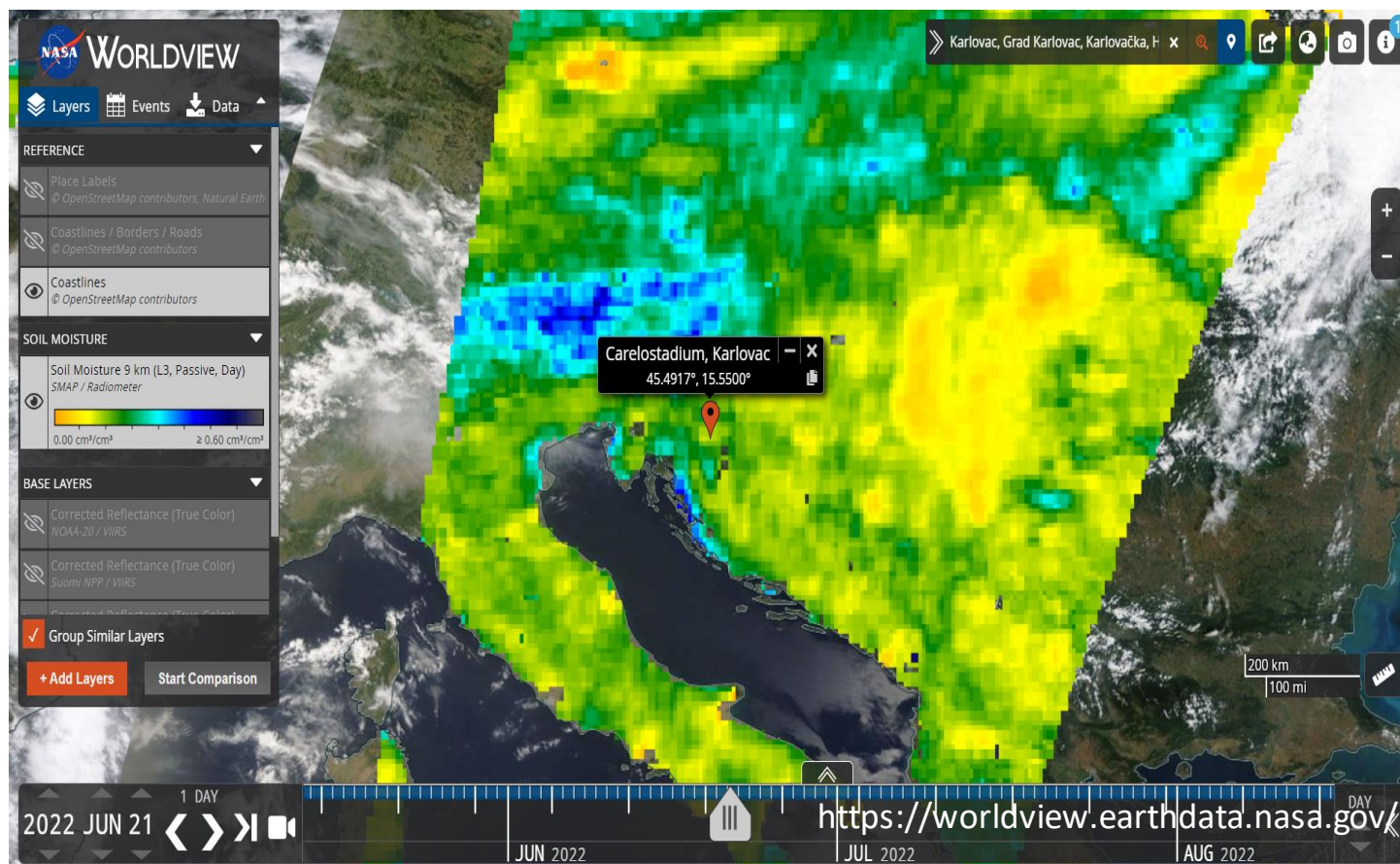
Time of measuring on both stations:

- 12:15 opening of the parasol on the sunny grass area
- 12:30 measuring of the surface temperatures on different surfaces
- 12:30 measuring the current air temperature on the atmospheric stations





Research methods

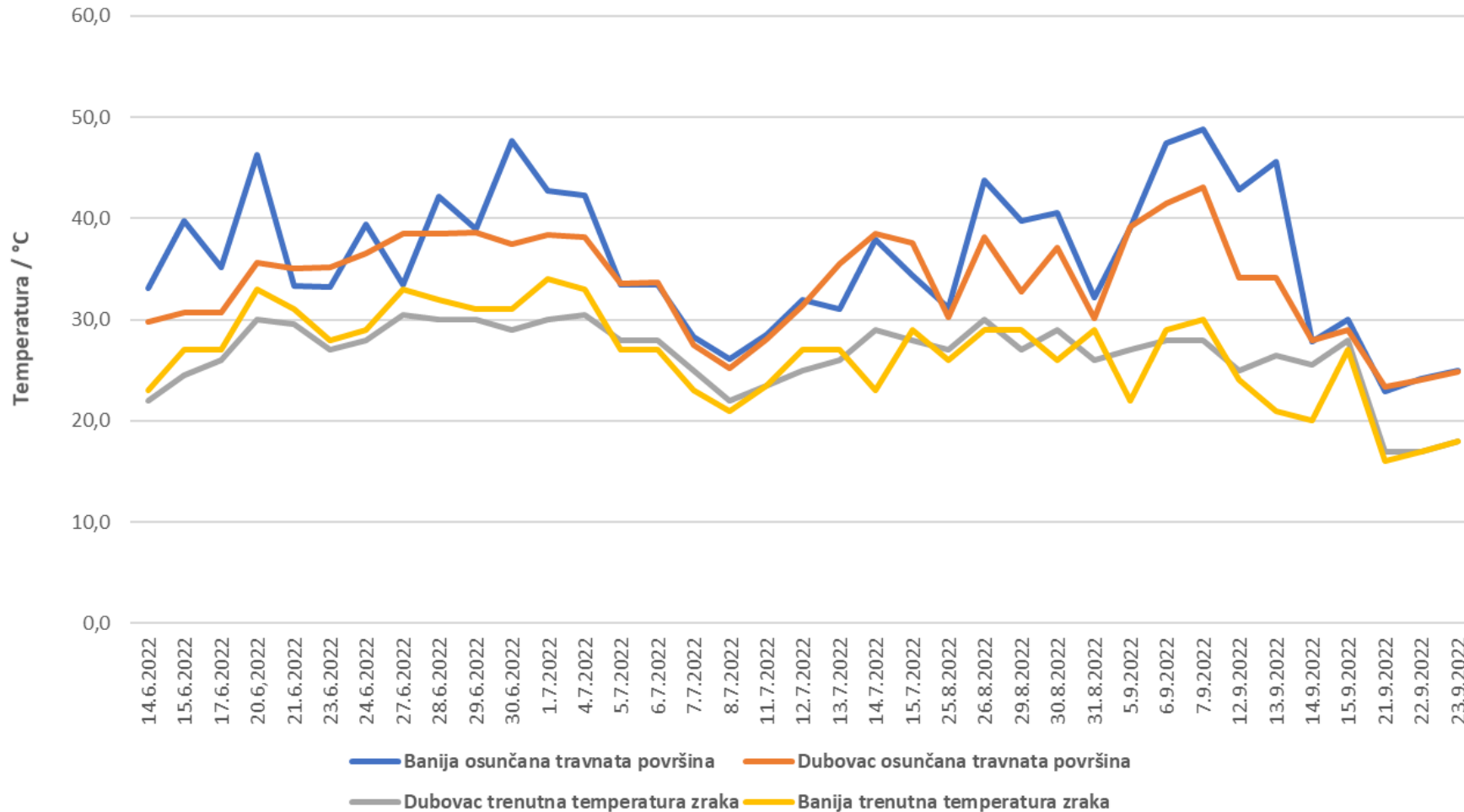


Data on soil moisture— we downloaded from the SMAP satellite database for Karlovac

The results



Comparison of the current air temperatures and surface soil temperatures on the sunny grassy areas at the GLOBE station Dubovac Primary School and Banija Primary School



37 warm and hot days in the researched period

1. The current air temperature is always lower than the surface temperature of the soil on the sunny grassy surface on both stations.

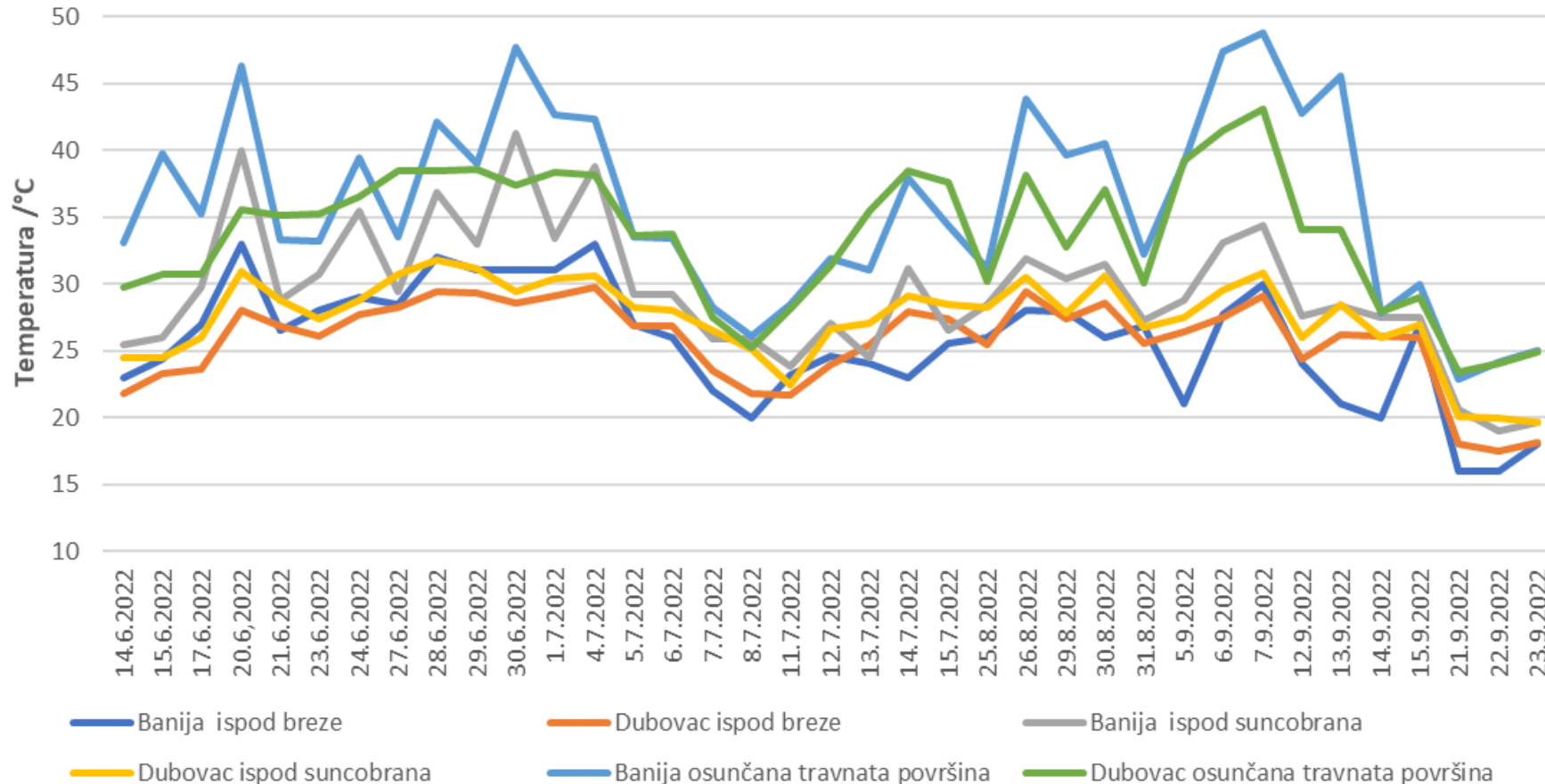
1. hypothesis



The results



Comparison the surface soil temperatures at the GLOBE stations of Dubovac Primary School and Banija Primary School



2. The surface temperature of the soil on the sunny grassy surface is always higher than the surface temperature of the soil on the grass under the birch trees and under the parasol on both stations.

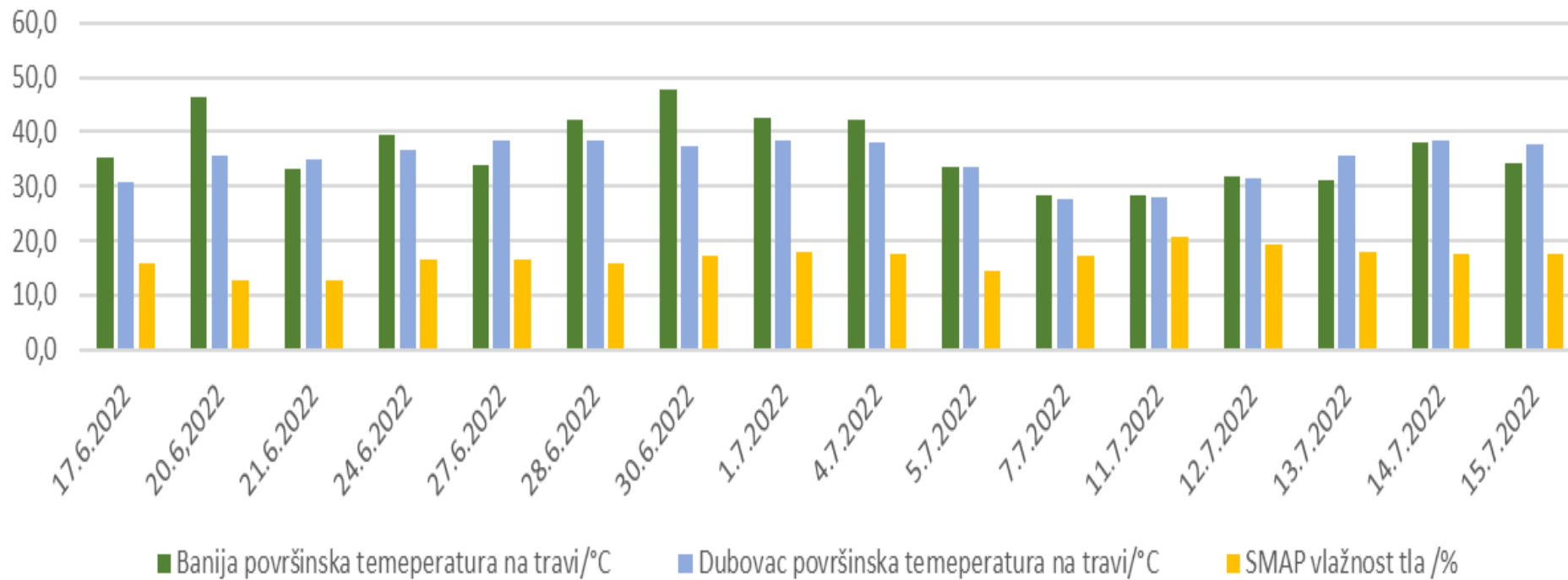
2. hypothesis



The results



Comparison of soil moisture SMAP(%) for Karlovac and surface temperature of the soil on the sunny grass surface (°C) at the Dubovac Primary School and Banija Primary School stations



3. In the observed period the soil moisture ranged from 12.9% to 20.7%, and the surface temperatures of the soil on sunny grassy areas were always higher than 27 °C at both stations.

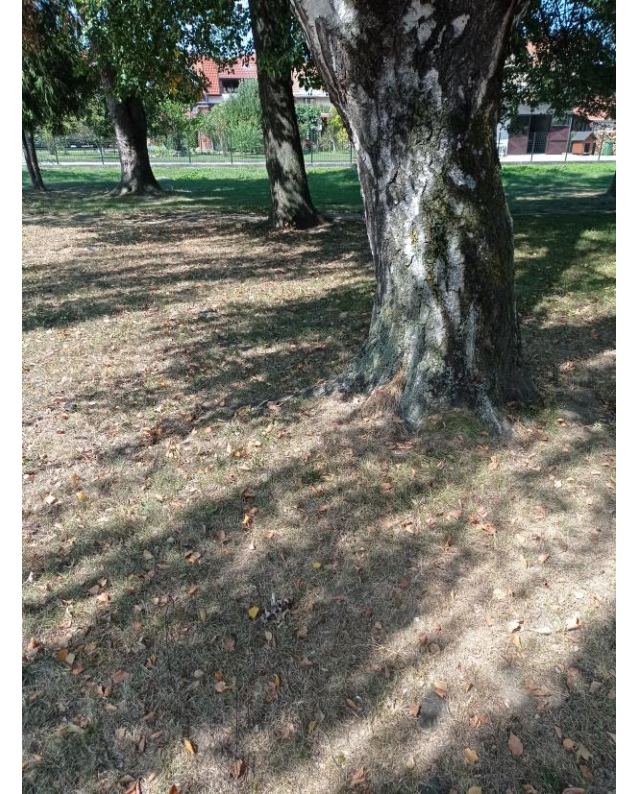
3. hypothesis



Conclusions and discussions

Possible causes of differences in measured current air temperatures at both stations:

- microclimatic differences and spatial environment



Possible causes of differences in measured soil temperatures on sunny grass surfaces and grass surfaces under the birch trees and the parasol:

- different sizes of vegetation on the measured surfaces

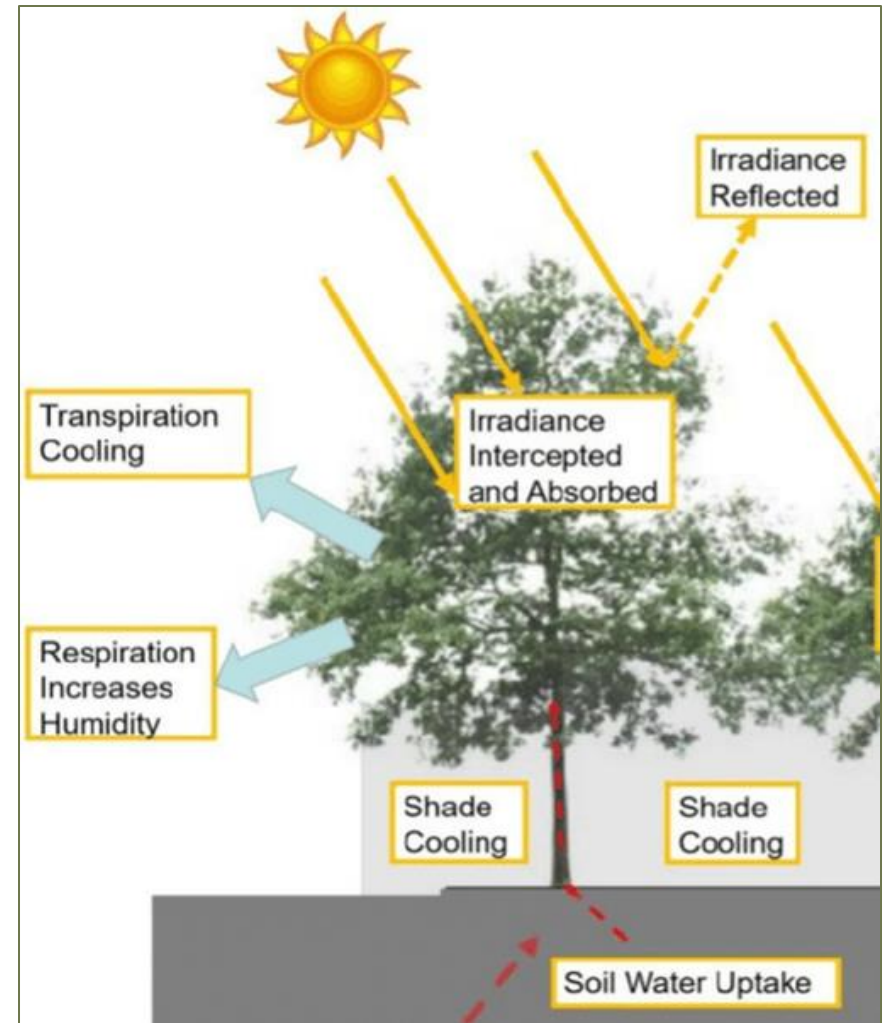


Conclusions and discussions

The surface temperature of the soil under the tree is lower because the tree with all its leaves absorbs solar energy.

In this process respiration and transpiration occur on the leaves, so the leaves cool down.

Transpiration and respiration on the leaves has a cooling effect and increases the humidity in the air, so the tree can act as an air conditioner on warm and hot days.





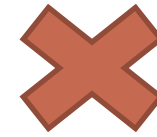
Conclusions and discussions

The parasol with its surface partially reflects and partially absorbs solar energy but has no cooling effect (respiration and transpiration).



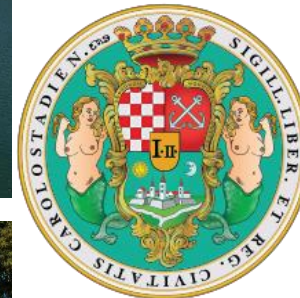


Conclusions and discussions



Since the city of Karlovac is known for its river tourism, we recommend that more trees should be planted on the banks of the rivers, which will replace the parasols.

Even though the city of Karlovac is the city of parks, there are not enough trees in some districts, so we suggest planting them to make the city more pleasant to live in in the summer.



Sources



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**Thank you
for your
attention**